

## Unusual phonon softening in the Kondo lattice $\text{CeCu}_2$

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$\text{CeCu}_2$  is a Kondo lattice with antiferromagnetic order below 3.5 K and a Kondo temperature of about 6 K. Earlier neutron scattering experiments (temperature dependent time-of-flight measurements on polycrystalline samples) lead to the assumption of a coupling between a crystal field transition (from the first to the second excited state) and some phonons around 14 meV\*. Newly performed inelastic neutron measurements on a  $\text{CeCu}_2$  single crystal confirm this assumption. We find an unusually strong (up to 15%), symmetry-dependent softening of certain phonons with increasing temperature. At the same time, the magnetic response is strongly broadened by the coupling to the phonons. The findings for  $\text{CeCu}_2$  are discussed in relation to the similar observation of a coupling between electronic and lattice degrees of freedom in  $\text{CeAl}_2$ <sup>†</sup> and  $\text{YbPO}_4$ <sup>‡</sup>.

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\*M. Loewenhaupt et al., JMMM **76&77** (1988) 415 and Physica B**163** (1990) 427

<sup>†</sup>M. Loewenhaupt et al., PRL **42** (1979) 1709 and Thalmeier and Fulde, PRL **49** (1982) 1588

<sup>‡</sup>C.-K. Loong, M. Loewenhaupt, J.C. Nipko, M. Braden, L.A. Boatner, PR **B60** (1999) R12 549